

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Original) An apparatus for mapping CELP parameters between a source codec and a destination codec, the apparatus comprising:
 - an LSP mapping module;
 - an adaptive codebook mapping module coupled to the LSP mapping module;
 - a fixed codebook mapping module coupled to the LSP mapping module and the adaptive codebook mapping module;
 - wherein the LSP mapping module comprises:
 - an LP overflow module configured to process information associated with a plurality of interpolated LSP parameters and generate an overflow signal based on at least information associated with the plurality of interpolated LSP parameters;
 - an LSP parameter modification module configured to modify at least one frequency of at least one of the plurality of interpolated LSP parameters in response to the overflow signal;
 - wherein the adaptive codebook mapping module comprises a first pitch gain codebook, the first pitch gain codebook including a first plurality of entries, each of the first plurality of entries including a plurality of terms and a plurality of sums associated with the plurality of terms;
 - wherein the fixed codebook mapping module comprises:
 - a first target processing module configured to process a first target signal and generate a first modified target signal;
 - a pulse search module configured to locate a first plurality of pulse positions and signs for a plurality of pulses in a subframe based on at least information associated with the first modified target signal;
 - a fixed codebook gain estimation module configured to estimate a fixed codebook gain for the subframe based on at least information associated with the first plurality of pulse positions and signs;

a pulse position searching module configured to receive the first modified target signal, an impulse response signal and the estimated fixed codebook gain and to output a second plurality of pulse positions and signs for the plurality of pulses.

2. (Original) The apparatus of claim 1 wherein the LSP parameter modification module is further configured to increase or decrease the at least one frequency of the at least one of the plurality of interpolated LSP parameters in response to the overflow signal.

3. (Original) The apparatus of claim 2 wherein the LSP parameter modification module is substantially free from a degradation of a signal quality.

4. (Original) The apparatus of claim 2 wherein a decoder of the destination codec is free from a signal overflow.

5. (Original) The apparatus of claim 1 wherein the plurality of terms are associated with at least one element related to a first gain coefficient for a first tap of a pitch filter, and the plurality of sums are associated with a plurality of products, the plurality of products associated with at least a second gain coefficient for a second tap of the pitch filter and a third gain coefficient for a third tap of the pitch filter.

6. (Original) The apparatus of claim 5 wherein the second tap of the pitch filter is the same as the third tap of the pitch filter.

7. (Original) The apparatus of claim 1 wherein the adaptive codebook mapping module is associated with a destination codec including a multi-tap pitch filter.

8. (Original) The apparatus of claim 1 wherein the pulse position searching module comprises:

a single track pulse search module configured to locate at least one position and one sign of at least one pulse in a first track;

a target update module configured to remove a contribution of the at least one pulse from the first target signal and output a first updated target signal;

a second target processing module configured to receive the first updated target signal and output a second modified target signal;

a buffer module configured to store the at least one position and one sign of the at least one pulse in the first track and output the second plurality of pulse positions and signs for the plurality of pulses.

9. (Original) The apparatus of claim 8 wherein the pulse position searching module further comprises a track selection module configured to select the first track.

10. (Original) The apparatus of claim 1 wherein the fixed codebook mapping module is associated with a fixed codebook, the fixed codebook being an algebraic fixed codebook or a multi-pulse fixed codebook.

11. (Original) The apparatus of claim 1 wherein the fixed codebook mapping module is associated with a destination codec including a sparse fixed codebook.

12. - 13. (Canceled).

14. (Original) The apparatus of claim 1 wherein the LSP mapping module further comprises:

an LSP quantization module configured to quantize the plurality of interpolated LSP parameters based on at least information associated with a plurality of quantization tables related to a destination codec;

an LSP decoder and stability check module configured to decode the quantized plurality of interpolated LSP parameters.

15. (Original) The apparatus of claim 14 wherein the LSP decoder and stability check module is further configured to process information associated with ordering and spacing between a first parameter and a second parameter of the decoded plurality of interpolated LSP parameters, the first parameter and the second parameter being adjacent to each other.

16. (Original) The apparatus of claim 1 wherein the adaptive codebook mapping module further comprises:

- an adaptive codebook target generation module configured to generate a second target signal;
- an adaptive codebook configured to store a plurality of excitation signals;
- a candidate lag selection module configured to receive an open-loop pitch lag and generate a candidate pitch lag value;
- a candidate vector signal generation module configured to generate a plurality of candidate signals based on at least information associated with the adaptive codebook and the candidate pitch lag value;
- an auto-correlation and cross-correlation module configured to calculate a set of dot products of the second target signal and delayed versions of the plurality of candidate signals or of the delayed versions of the plurality of candidate signals, and to output a vector signal associated with at least the set of dot products;
- a gain codevector selection module configured to receive the vector signal, to estimate a dot product of an entry associated with the first pitch gain codebook and the received vector signal, processing at least information associated with the dot product and a predetermined value, and output an index of a selected codevector and an adaptive codebook pitch lag associated with the selected codevector;
- a buffer module to store the index of the selected codevector and the adaptive codebook pitch lag.

17. (Original) The apparatus of claim 16 wherein the predetermined value is a predetermined maximum value.

18. (Original) The apparatus of claim 16 wherein the first plurality of entries are correlated to a second plurality of entries of a second pitch gain codebook of a destination codec.

19. (Original) The apparatus of claim 16, wherein the vector signal is associated with the plurality of terms and the plurality of sums.

20. (Original) The apparatus of claim 1 wherein the fixed codebook mapping module comprises:

a fixed codebook target generation module configured to generate the first target signal;

a codevector construction module configured to receive the second plurality of pulse positions and signs, to generate a fixed codebook vector based on at least information associated with the second plurality of pulse positions and signs, and to determine fixed codebook indices for the subframe based on at least information associated with the second plurality of pulse positions and signs.

21. (Original) The apparatus of claim 1 wherein the LSP mapping module, the adaptive codebook mapping module, and the fixed codebook mapping module are configured to operate independently of each other.

22. (Original) An apparatus for mapping LSP parameters between a source codec and a destination codec, the apparatus comprising:

an LP overflow module configured to process information associated with a plurality of interpolated LSP parameters and generate an overflow signal based on at least information associated with the plurality of interpolated LSP parameters;

an LSP parameter modification module configured to modify at least one frequency of at least one of the plurality of interpolated LSP parameters in response to the overflow signal;

an LSP quantization module configured to quantize the plurality of interpolated LSP parameters based on at least information associated with a plurality of quantization tables related to a destination codec;

an LSP decoder and stability check module configured to decode the quantized plurality of interpolated LSP parameters.

23. (Original) An apparatus for mapping adaptive codebooks between a source codec and a destination codec, the apparatus comprising:

an adaptive codebook target generation module configured to generate a target signal;

a pitch gain codebook, the pitch gain codebook including a plurality of entries, each of the plurality of entries including a plurality of terms and a plurality of sums associated with the plurality of terms;

a candidate lag selection module configured to receive an open-loop pitch lag and generate a candidate pitch lag value;

a candidate vector signal generation module configured to generate a plurality of candidate signals based on at least information associated with the adaptive codebook and the candidate pitch lag value;

an auto-correlation and cross-correlation module configured to calculate a set of dot products of the target signal and delayed versions of the plurality of candidate signals or of the delayed versions of the plurality of candidate signals, and to output a vector signal associated with at least the set of dot products;

a gain codevector selection module configured to receive the vector signal, to compute a dot product of an entry associated with the pitch gain codebook and the received vector signal, processing at least information associated with the dot product and a predetermined value, and output an index of a selected codevector and an adaptive codebook pitch lag associated with the selected codevector;

a buffer module to store the index of the selected codevector and the adaptive codebook pitch lag.

24. (Currently Amended) An apparatus for mapping fixed codebooks between a source codec and a destination codec, the apparatus comprising:

a fixed codebook target generation module configured to generate a target signal;

a target processing module configured to process the target signal and generate a first modified target signal;

a pulse search module configured to locate a first plurality of pulse positions and signs for a plurality of pulses in a subframe based on at least information associated with the first modified target signal;

a fixed codebook gain estimation module configured to estimate a fixed codebook gain for the subframe based on at least information associated with the first plurality of pulse positions and signs;

a pulse position searching module configured to receive the first modified target signal, an impulse response signal and the estimated fixed codebook gain and to output a second plurality of pulse positions and signs for the plurality of pulses;

a codevector construction module configured to receive the second plurality of pulse positions and signs, to generate a fixed codebook vector, and to determine [[the]] a set of fixed codebook indices for the subframe.

25. (Currently Amended) The apparatus of claim 23 wherein the pulse position searching module comprises:

a single track pulse search module configured to locate at least one position and one sign of at least one pulse in a first track;

a target update module configured to remove a contribution of the at least one pulse from [[the]] a first target signal and output a first updated target signal;

a second target processing module configured to receive the first updated target signal and output a second modified target signal;

a buffer module configured to store the at least one position and one sign of the at least one pulse in the first track and output [[the]] a second plurality of pulse positions and signs for [[the]] a plurality of pulses.

26. - 38. (Canceled).

39. (New) A method for CELP parameter mapping comprising the steps of:
unpacking a CELP parameter bitstream into at least a set of first quantized LSP values, a set of first quantized adaptive codebook values and a set of first quantized fixed codebook values;

mapping the set of first quantized LSP values to a set of second quantized LSP values;

mapping the set of first quantized adaptive codebook parameters to a set of second quantized adaptive codebook parameters;

mapping the set of first quantized fixed codebook parameters to a second set of quantized fixed codebook parameters; and

organizing at least the set of second quantized LSP values, the set of second quantized adaptive codebook parameters and the set of second quantized fixed codebook parameters in an outgoing bitstream.

40. (New) A method of mapping a first set of quantized CELP LSP parameters to a second set of quantized LSP parameters comprising the steps of:
selecting a set of one or more LSP values from a target codebook of one or more LSP values based on at least one other LSP value selected from a source codebook;
determining a stability value for a filter represented by the set of LSP values and a measure of difference between the target codebook and the source codebook; and
modifying the selected set of one or more LSP values based on the stability value.

41. (New) The method of claim 40 wherein determining the stability value comprises calculating a spread measure of the set of one or more LSP values.

42. (New) The method of claim 40 wherein selecting a set of one or more LSP values from a target codebook comprises:
calculating a set of difference values between each LSP value and each value in the target codebook;
determining a least difference value from the set of difference values;
setting the value in the target codebook corresponding to the least difference value as a selected LSP value.

43. (New) The method of claim 40 wherein selecting a set of one or more LSP values from a target codebook comprises using a vector quantization method.

44. (New) A method for mapping a first quantized set of CELP adaptive codebook parameters to a second quantized set of CELP adaptive codebook parameters comprising the steps of:
determining a set of expected correlation values between a target vector and a set of codebook vectors associated with a lag value;
selecting a subset of codebook vectors from the set of codebook vectors based on the set of expected correlation values;

calculating a correlation value between the target vector and each vector in the subset of codebook vectors;

selecting a codebook vector associated with the correlation value above a predetermined threshold;

calculating a gain value based on the difference between the target vector and the selected codebook vector; and

setting at least the lag associated with the selected codebook vector and the gain value as the destination adaptive codebook parameters.

45. (New) The method of claim 44 wherein determining a set of expected correlation values between a target vector and a set of codebook vectors associated with a lag value comprises determining correlation values between the target vector and a time shifted version of the target vector.

46. (New) A method for mapping a first set of quantized CELP fixed codebook parameters from a second set of quantized CELP fixed codebook parameters comprising the steps of:

determining a target vector;

setting a threshold value;

selecting a vector of pulses from a codebook of pulses;

calculating an output response of a synthesis filter when the selected vector of pulses is used as input to the synthesis filter;

calculating a difference value between the calculated output response and the target vector;

setting the selected vector of pulses as a destination vector of pulses if the difference value is below the set threshold;

calculating a gain value between the destination vector and the target vector; and

setting at least the gain value and the destination vector as the second set of quantized CELP fixed codebook parameters.

47. (New) The method of claim 46 wherein selecting a vector of pulses from a codebook of pulses comprises:

selecting a pulse position from the codebook of pulses;
inserting a pulse at the selected pulse position in the vector of pulses; and
removing all pulses from the vector of pulses if the number of selected pulses
exceeds a predetermined maximum number of allowable pulses.

48. (New) The method of claim 46 wherein the difference value is associated
with a correlation value.

49. (New) The method of claim 46 wherein setting a threshold value
comprises:
calculating a set of autocorrelation values of the target vector;
determining a set of one or more positions corresponding to a set of maximum
autocorrelation values;
calculating an expected difference value between the target vector and a vector
containing a maximum number of pulses located at positions from the determined set of
positions; and
multiplying the expected difference value with a weighting factor.